man of science installed in his laboratory in all important manufactories and encouraged to help in their development." Great employers have it in their power to advance the education of the people all along the line. Technical instruction in all its stages is a practical thing; and when it is realised that employers appreciate the instructed and intelligent student, then parents will begin to see that education has a practical value. The educational gospel should be "Believe, believe," not only or chiefly in machinery, in a curriculum, a laboratory, a library, but in the value of knowledge, of intelligence, of training, and when we have made this belief widespread an important step will have been taken toward the education of our people.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, December 14, 1905.—"Report on the Psychology and Sociology of the Todas and other Indian Tribes." By Dr. W. H. R. **Rivers.** Communicated by the Secretaries of the Royal Society.

An abstract of observations made chiefly on the Todas of the Nilgiri Hills. The psychological work deals chiefly with the senses, in only two of which is there evidence of decided difference between Todas and Englishmen. The former were less sensitive to pain, and showed certain deficiencies in the colour-sense, especially in the degree of relative sensibility to red and blue, a low degree of sensibility for blue being associated with defective nomenclature for that colour. Definite colour-blindness was found in 12 per cent. of the males, a frequency higher than has been recorded in any other race. Quantitative observations were made on two visual illusions, one of which, that of compared horizontal and vertical lines, was distinctly more pronounced in the Todas, while the other, the Müller-Lyer illusion, was present in a slighter degree. This difference is believed to depend on the difference in nature of the two illusions. Especial attention was paid to the variability of the individuals subjected to the tests, and it is shown that there is some evidence of correlation between the degree of general intellectual development and certain simple mental activities which can be tested by experimental methods.

The sociology of the Todas was studied by means of the genealogical method, and was found to have many points of resemblance with that of Malabar, and the view is advanced that the Todas at one time inhabited that district and are probably of the same race as the present inhabitants of Malabar, the Nairs and Nambutiris. A detailed record was obtained of the elaborate religious ritual of the Todas, and evidence is given that this religion has undergone degenerative changes. It is suggested that this is part of the general disappearance of a higher culture which the Todas brought with them to the Nilgiri Hills.

"On the Spectrum of the Spontaneous Luminous Radiation of Radium. Part IV.—Extension of the Glow." By Sir William **Huggins,** K.C.B., O.M., F.R.S., and Lady **Huggins.**

In our second paper[1] we suggest "whether the β rays, which are analogous to the kathode corpuscles, may not be mainly operative in exciting the radium glow. On this surmise it would be reasonable to expect some little extension of the glow outside the limit of the solid radium itself. We are unable to detect any halo of luminosity outside the limit of the solid radium bromide; the glow appears to end with sudden abruptness at the boundary surface of the radium." We omitted to state that this conclusion was arrived at by eye observations. The radium was observed in the dark with a lens, and with a low-power microscope.

The earlier photographs of the spectrum of the glow were taken, for the purpose of comparison spectra, with the height of the slit reduced by shutters so as to be within the width of the exposed radium bromide, and, therefore, these photographs would not show whether the bright bands of nitrogen extend into the air beyond the radium. Subsequently photographs were taken with the whole height of the slit, and on these we find that all the bands of nitrogen do extend to some little distance outside the radium salt. Our attention at the time being directed to other phenomena of the glow, we did not examine the photographs to see if the nitrogen bands extended beyond the radium.

In a paper, dated August 22, 1905, F. Himstedt and G. Meyer[1] state that in their photographs of the spectrum of $RaBr_2$, the four nitrogen bands, 3577, 3371, about 3300, and 3159, extend beyond the radium salt, while the other less refrangible bands are not traceable outside the radium. In our photographs all the nitrogen bands project beyond the radium salt, the relative distance to which the extension can be detected in the case of each band being, as might be expected, in proportion to the strength of the impression of that band upon the photographic plate.

B. Walter and R. Pohl, in a paper dated September, 1905,[2] give an account of experiments made with the help of screens, which show that for a distance of up to about 2 cm. the air surrounding radium bromide has an action on a photographic plate.

On re-examining an early photograph, taken in 1903 for another purpose, which is described in our second paper,[3] in which the $RaBr_2$ was enclosed in a very narrow tube of thin glass, we find that the bands of nitrogen, which are strong within the tube, show no trace of extension on the plate beyond the tube. The exposure of this plate was seven days.

This experiment, which we have repeated recently with an exposure of fourteen days, shows that the luminosity of nitrogen in the near neighbourhood of radium bromide is not due to the kathode-like β radiation, for this passes freely through glass.

Two explanations may be suggested: first, that the active cause is the α rays;[4] or secondly, that the nitrogen molecules which encounter those molecules of the radium which are undergoing active changes are broken up into ions, which are projected outwards, and give rise to the glow of luminous nitrogen.[5]

Royal Astronomical Society, January 12.—Mr. W. H Maw, president, in the chair.—Photograph of comet *c*, 1905, taken at the Royal Observatory, Greenwich, on January 8: **Astronomer Royal.** The photograph showed the comet with a bright nucleus and a faint, straight tail extending about 2°. It was hoped that further photographs would be obtained after the comet had passed the sun.—The ring nebula in Lyra: E. E. **Barnard.** A careful series of measures of the positions of the stars about the nebula appeared to show that the star in the centre of the ring had neither proper motion nor parallax.—Mean areas and heliographic latitudes of sun-spots in the year 1904: **Astronomer Royal.**—Photographic reproduction of *réseaux* for star photography: H. **Bourget.** Specimens of the *réseaux* were shown on the screen.—Report on observations of Jupiter at Trincomali, Ceylon, 1904–5: Major P. B. **Molesworth.** Special attention was directed to the remarkable movement of the south tropical dark area in the neighbourhood of the great red spot. The motion of the area across the red spot bay was so rapid that it seemed necessary to assign some cause other than the actual transference of matter.—Measures of wide double stars: Rev. T. E. **Espin.**—Action of the wood of the dark slide upon photographic plates: Prof. H. H. **Turner.** The plates were negatives of the solar eclipse taken at Aswan by Mr. J. H. Reynolds, which were greatly injured by strong impressions of the grain of the wood of the dark slides in which they were placed after exposure. The same had occurred to Dr. Copeland's plates taken in 1898. It was stated that the wood of Mr. Reynolds's slides was very old, and various suggestions were made, but the real cause of this effect upon the plates still appeared obscure.—Lunar nomenclature: W. **Goodacre.**—Measures of the lunar crater Mösting A made at the Royal Observatory, Greenwich: **Astronomer Royal.**

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[1] *Roy. Soc. Proc.*, vol. lxxii., p. 410 (1903).

[1] F. Himsted and G. Meyer, *Ber. d. Nat. Gesells. Freiberg* vol. xvi. pp. 13–17.

[2] B Walter and R. Pohl, *Ann. de Phys.*, vol. xviii., p. 406.

[3] *Roy. Soc. Proc.*, vol. lxxii., p. 412.

[4] B. Walter, July, 1905, showed by means of absorption screens that the radiation from radio-tellurium can produce the ultra-violet light of nitrogen (*Ann. d. Phys*, vol. xvii., p. 367).

[5] The experiments described in our last paper showed that probably the β rays are not the operative cause of the nitrogen glow (*Roy. Soc. Proc.*, vol. lxxvi., p. 488).

PARIS.

Academy of Sciences, January 15.—M. H. Poincaré in the chair.—The landing of aëroplanes: Bouquet **de la Grye.** A plan of arresting an aëroplane, and capable of keeping it horizontal during its descent, is described. It has been found to work in experiments on the small scale.—The *n*-rays: M. **Mascart** (see p. 325).—The influence of the reaction of the medium on the activity of amylase and on the composition of saccharified starch: L. **Maquenne** and Eug. **Roux.** The effect of the acidity or alkalinity of the solution on the hydrolysis of starch by malt has been recognised by other workers, without, however, the effect being quantitatively determined. The author shows that phenolphthalein is an unsuitable indicator to use for these experiments, methyl orange being better. He has found that for a rapid hydrolysis it is first necessary to neutralise the alkali of the starch, then to add to the malt a quantity of sulphuric acid equal to about 0·4 of that which would be required to neutralise it completely. Not only can the rate of hydrolysis be greatly increased by this treatment, but the proportion of maltose formed is also raised about 10 per cent. to 15 per cent.—Observations on the subject of the group C(OH) of the tertiary alcohols: Louis **Henry.** Tertiary butyl alcohol is converted by aqueous fuming hydrochloric acid into the corresponding chloride with great ease; by the substitution of the hydrogen atoms of the methyl groups by other elements the action of the hydrochloric acid is modified, the velocity of the reaction and amount of the ester formed being reduced, or the action altogether prevented. In the present paper the effects produced by the introduction of chlorine, cyanogen, and oxygen are discussed.—Some integrals of partial differential equations: E. **Goursat.**—A family of conjugated networks with the same congruence: E. **Merlin.**—The impossibility of negative waves of shock in gases: Gyözö **Zemplén.** A reply to the criticisms of P. Duhem on a former note on the same subject.—The conditions of establishment and application of progressive damping for the oscillations of road vehicles: A. **Krebs.** It is shown by a theoretical analysis of the problem that the friction of ordinary carriage springs ceases to be efficient when the sudden change of level is more than 2 cm. A new arrangement is described which satisfies the theoretical conditions for greater oscillations, and which has been found to work well in practice.—Photographic experiments on the action of the *n*-rays on an oscillating spark: C. **Gutton.** If the *n*-rays are allowed to fall on the primary spark of a Hertzian oscillator, the secondary spark diminishes. The present paper deals with the photographic registration of this effect.—The density of ice: A. **Leduc.** About 108 grams of water were frozen in each of the author's experiments. Well boiled distilled water gave a density of 0·9172, but it was clear that this number was too small, since in the upper part of the density flask small strings of separated air bubbles were visible. By repeatedly melting and freezing in a vacuum, the density was raised to 0·9176, and even in this case there was some evidence of traces of dissolved air. It is pointed out that the usual method of analysing the gases dissolved by water must be inexact, since all gas is not expelled by boiling.—The distribution of electric currents in a network: I. **Réviliod.**—A parhydric valve: J. de Rohan **Chabot.** A description of a new form of valve for preventing the return of water into the vacuum of a filter pump.—Correction to a note on the saline oxide of nickel: H. **Baubigny.**—The silicide of copper, and a new mode of formation of silicon soluble in hydrofluoric acid: Paul **Lebeau.** When the amount of silicon in a copper silicon mixture is raised above 10 per cent., a metallographic examination shows the presence of free silicon.—A silicide of thorium: O. **Hönigschmid.** This has been prepared by heating together a mixture of aluminium, potassium fluosilicate, and the double fluoride of thorium and potassium; the excess of aluminium is removed by treatment with potash solutions. The compound isolated, the chemical and physical properties of which are given, has the composition $ThSi_2$.—The diazo-derivatives of the diamines: Léo **Vignon.**—The estimation of carbon monoxide in air by iodic anhydride: Albert **Lévy** and A. **Pécoul.** Although acetylene reacts with iodic anhydride, it does not interfere with the estimation of minute amounts of carbon monoxide in air, since a mixture of 1 part of acetylene in 10,000 parts of air gives no iodine.—The estimation of small quantities of chloroform in air and in blood or in aqueous solution: Maurice **Nicloux.** A combination of the methods of Dumas (the action of alcoholic potash on chloroform) and Mohr (chlorine titration in presence of a chromate).—The combustion of acetylene by oxygen: Paul **Mauricheau-Beaupré.** An examination of the products of combustion of the oxy-acetylenic blow-pipe flame showed that oxides of nitrogen and ozone were present, but no trace of carbon monoxide.—The direct proportionality between the cryoscopic point of a mineral water of the bicarbonate class and the composition of this water expressed as anhydrous monocarbonate: Lucien **Graux.** The half-bound carbonic acid is without effect on the freezing point.—Mixed crystals of alkaline nitrates: Fréd. **Wallerant.**—The alkaline rocks in the neighbourhood of Evisa, Corsica: M. **Deprat.**—The yield of urine: Henri **Lamy** and André **Mayer.**—The vitelline of the egg: L. **Hugounenq.**—New researches on the oxidations produced by animal tissues in the presence of ferrous salts: F. **Battelli** and Mlle. L. **Stern.** Examples of the analogy between the oxidations produced by hydrogen peroxide in presence of ferrous sulphate and by animal extracts in presence of the same salt.—The anomalous behaviour of the proteolysis produced by papaine: C. **Delezenne,** H. **Mouton,** and E. **Pozerski.**—The whitening of wheaten flour: E. **Fleurent.** The oxides of nitrogen are more favourable than ozone, the latter giving an objectionable smell to the flour.—Geology of the Peloponnesus: Ph. **Négris.**—An ancient volcanic chain to the N.W. of the Puys chain: Ph. **Glangeaud.**—Magnetic observations made at Sfax, Tunis, on the occasion of the total eclipse of the sun of August 30, 1905: M. **Dehalu.**

January 22.—M. H. Poincaré in the chair.—The boiling of osmium, ruthenium, platinum, palladium, iridium, and rhodium: Henri **Moissan** (see p. 325).—The origin of the idea of solid solutions: Lecoq **de Boisbaudran.** A claim for priority in the idea of solid solution.—Glycuronic acid in the blood corpuscles: R. **Lépine** and M. **Boulud.** The authors point out the liability of changes in the glycuronic acid contents of the blood after it has left the blood-vessel, and the precautions necessary to avoid such change.—A theorem relating to the second differentials of the potential of an attracting volume: A. **Korn.**—Elliptical polarisation produced by mixed liquids: J. **Chaudier.**—Some new magneto-optical properties of colloidal solutions of oxide of iron: A. **Cotton** and H. **Mouton.**—The kathodic phosphorescence of europium: G. **Urbain.** Certain differences in the spectra observed might be interpreted as being due to two elements in europium, or possibly to purely physical causes independent of the elementary complexity. Further experiments will be made to elucidate this point.—Mixtures of antimony and tellurium, antimony and selenium, and the cryoscopic constant of antimony: H. **Pélabon.**—Methoxytrichloropentanol 1 : 5 : 4 and α-trichloromethyltetrahydrofurfurane: J. L. **Hamonet.**—Acetylenic amides and nitriles: Ch. **Moureu** and I. **Lazennec.** A general method for preparing the amide $R{-}C{\equiv}C{-}CONH_2$ and the corresponding nitriles is given.—Glycidic condensation of the aldehydes with α-chloropropionic ester: Georges **Darzens.**—The acyclic vinyl and β-chloroethyl ketones: E. E. **Blaise** and M. **Maire.**—A crystalline modification stable in two intervals of temperature: Fréd. **Wallerant.**—The influence of the colouring matters in a mother liquid on the form of the crystals deposited: P. **Gaubert.** During their growth, crystals of phthalic acid can absorb a certain quantity of foreign material which exercises an influence on their form and size. The different faces are not penetrated by the foreign substance with the same facility. The actual amounts of the colouring matters included were small, 1/170th for methylene blue and less for other substances.—The mechanism of the fall of certain terminal buds: A. **Tison.**—A new genus of fungus from British East Africa: P. **Hariot** and N. **Patouillard.**—The variations of phosphoric acid and nitrogen in the juices of the leaves of certain plants: G. **André.** In an annual plant, a part of the phosphoric acid leaves the leaf and goes towards the ovule in the state of a soluble mineral phosphate, whilst another part is displaced from its state of combination with nitrogenous material.—The properties of colloids and the dynamic interpretation of cell division: Angel **Gallardo**.—On *Leposphilus labrei* and on the family of the Philichthydæ: A. **Quidor**.—The action of extract of the interstitial gland of the testicle on the development of the skeleton and on the genital organs: P. **Bouin** and P. **Ancel**.—Experimental researches on the proportions of chloroform contained in the organism during chloroform anæsthesia: J. **Tissot**.—The action of sulphate of hordenine on the circulation: L. **Camus**. With large doses there is an increase of the blood pressure accompanied with modifications in the rhythm and amplitude of the pulsations; small doses have little effect on the blood pressure, but give rise to important changes in the number and amplitude of the pulsations.—The reconstitution of an ancient Oligocene lake on the north side of the massif of Mont Doré: Ph. **Glangeaud**.—New observations on the geology of the Sahara: René **Chudeau**.—On the formation of the network of the reticulated Nummulites: Jean **Boussac**.—The oceanic circulation: MM. **Thoulet** and **Chevallier**.

DIARY OF SOCIETIES.

THURSDAY, February 1.

Royal Society, at 4.30.—On the Filtration of Crystalloids and Colloids through Gelatin, with Special Reference to the Behaviour of Hæmolysins: J. A. Craw.—Chemical Action of *Bacillus lactis aerogenes* (Escherich) on Glucose and Mannitol: Production of 2: 3-Butyleneglycol and Acetylmethylcarbinol: Dr. A. Harden and G. S. Walpole.—On Voges and Proskauer's Reaction for Certain Bacteria: Dr. A. Harden.—The Quantitative Estimation of Small Quantities of Nickel in Organic Substances: H. W. Armit and Dr. A. Harden.—The Alcoholic Ferment of Yeast Juice: Dr. A. Harden and W. J. Young.—On the Function of Silica in the Nutrition of Cereals. Part I.: A. D. Hall and C. G. T. Morison.—On the Origin of the Sertoli or Foot Cells of the Testis: C. E. Walker and Miss A. L. Embleton.—Studies on Enzyme Action—Lipase: Maurice Nicloux.—A Further Communication on the Specificity and Action in Vitro of Gastrotoxin: Dr. C. Bolton.

Chemical Society, at 8.30.—Hydroxylamine-$\alpha\beta$-disulphonates (Structural Isomerides of Hydroxyamino-sulphates or Hydroxylamine-$\beta\beta$-disulphonates): T. Haga.—Studies in the Camphane Series. Part XXI. Benzenediazo-ψ-Semicarbazino-camphor and its Derivatives: M. O. Forster.—The Relation between Absorption Spectra and Chemical Constitution. Part I. The Chemical Reactivity of the Carbonyl Group: A. W. Stewart and E. C. C. Baly.—(1) The Relation between Absorption Spectra and Chemical Constitution. Part II. The Quinones and α-Diketones; (2) The Relation between Absorption Spectra and Chemical Constitution. Part III. The Nitranilines and the Nitrophenols: E. C. C. Baly and A. W. Stewart.—The Action of Light on Benzylidenephenylhydrazine: F. D. Chattaway.—The Union of Chlorine and Hydrogen: D. L. Chapman and C. H. Burgess.—Note on the Molecular Weight of Adrenaline: G. Barger and A. J. Ewins.—The Critical Temperature and Value of ML/O of Some Carbon Compounds: J. Campbell Brown.

Royal Institution, at 5.—The Significance of the Future in the Theory of Evolution: Benjamin Kidd.

Civil and Mechanical Engineers' Society, at 8.—Destructor Byeproducts: F. L Watson.

Linnean Society, at 8.—The Percy Sladen Trust Expedition to the Indian Ocean in H.M.S. *Sealark*: J. Stanley Gardiner.

Society of Arts, at 8.—Howard Lecture: High Speed Electric Machinery, with Special Reference to Steam-Turbine Machines: Prof. S. P. Thompson, F.R.S.

FRIDAY, February 2.

Royal Institution, at 9.—The Electric Production of Nitrates from the Atmosphere: Prof. S. P. Thompson, F.R S.

Geologists' Association, at 7.30.—Annual General Meeting. Presidential Address: The Study of Fossil Fishes: Dr. A. Smith Woodward, F.R.S.

SATURDAY, February 3.

Royal Institution, at 3.—Advances in Microscopy: J. W. Gordon.

MONDAY, February 5.

Royal Institution, at 5.—General Monthly Meeting.

Society of Arts, at 8.—Modern Warships: Sir William White, K.C.B., F.R.S.

Society of Chemical Industry, at 8.—The Loss of Nitre in the Chamber Process. Part II.: J. K. H. Inglis.

Victoria Institute, at 4.30.—On Biological Changes in Geological Time: Prof. J. Logan Lobley.

TUESDAY, February 6.

Royal Institution, at 5.—Food and Nutrition: Prof. W. Stirling.

Society of Arts, at 4.30.—Imperial Immigration: O. C. Beale.

Zoological Society, at 8.30.—On Trichorhiza, a New Hydroid Genus: E. S. Russell.—Notes on the Histology and Physiology of the Placenta in Ungulata; Dr. J. W. Jenkinson.—Description of a New Fly of the Family Tabanidæ: Miss G. Ricardo.—A List of the Mammals obtained by Messrs. R. B. Woosnam and R. E. Dent in Bechuanaland: H. Schwann.

Institution of Civil Engineers, at 8.—*Adjourned Discussion*: The Railway-Gauges of India: F. R. Upcott.

WEDNESDAY, February 7.

Society of Public Analysts, at 8.—President's Annual Address, followed by Ordinary Meeting.—Note on Dutch Cheese: C. H. Cribb.—The Assay of Mercury Ores: G. T. Holloway.—The Purification of Zinc and Hydrochloric Acid: Dr. L. T. Thorne and E. H. Jeffers.—The Facing of Rice: C. H. Cribb and P. A. E. Richards.

Geological Society, at 8.—On the Carboniferous Limestone (Avonian) of the Mendip Area (Somerset), with Especial Reference to the Palæontological Sequence: T. F. Sibley.—The Igneous Rocks Associated with the Old Red Sandstone of the Mendips: Prof. S. H. Reynolds.

Society of Arts, at 8.—Progress in Electric Lighting: Leon Gaster.

THURSDAY, February 8.

Royal Society, at 4.30.—*Probable Papers*: On Roche's Ellipsoids and on Allied Problems Relating to Satellites: Sir George H. Darwin, K.C.B., F.R.S.—On Periodicities in Sun-spots: Prof. A. Schuster, F.R.S.—Explosions of Coal-Gas and Air: Prof. B. Hopkinson.—Polarisation in Secondary Röntgen Radiation: C. G. Barkla.—Constants of Explosion of Cordite and of Modified Cordite: Robert Robertson.

Institution of Electrical Engineers, at 8.—Technical Considerations in Electric Railway Engineering: F. W. Carter (*Conclusion of Discussion*).—Crane Motors and Controllers: C. W. Hill.

Royal Institution, at 5.—The Significance of the Future in the Theory of Evolution: Benjamin Kidd.

FRIDAY, February 9.

Royal Institution, at 9.—Eclipse Problems and Observations: H. F. Newall, F.R.S.

Royal Astronomical Society, at 5.—Anniversary Meeting.

Physical Society, at 8.—Annual General Meeting.

Royal Geographical Society, at 5.30 (Research Department).—The Ruins of Rhodesia and the Probable Date of Outside Intrusions in East Africa: Discussion to be opened by D. Randall MacIver.

Malacological Society, at 8.—Annual Meeting.—On Pearl-Oyster Culture and Pearl Fishing: T. H. Haynes.—Irish Molluscs and their Habitats: R. J. Welch.

Institution of Civil Engineers, at 8.—Electric Driving at the Locomotive Works of the North London Railway: R. H. Mackie.

SATURDAY, February 10.

Royal Institution, at 3.—Advances in Microscopy; J. W. Gordon.

MONDAY, February 12.

Royal Geographical Society, at 8.30.—The Geography of the Spanish Armada: Rev. W. Spotswood Green.

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